formation of gap states, electronic transitions at the isomer energy are forbidden, thus blocking IC.

In order to determine the lattice location of ^{229}Th, ^{229}Ac^{+} ions were implanted (at 30 keV) into a CaF_2 single crystal at the EC-SLI set-up. The β^{-} emission channelling patterns from ^{229}Ac were measured in the vicinity of the CaF_2 $\langle 211\rangle$, $\langle 111\rangle$, $\langle 100\rangle$ and $\langle 110\rangle$ directions. Because the ^{229}Th daughter nuclei are recoiled with an energy of only 2.3 eV, below typical threshold displacement energies, they are expected to occupy the same lattice sites as those determined for ^{229}Ac. Preliminary analysis shows that the majority (at least 75 %) of the ^{229}Ac atoms occupy Ca substitutional sites. In addition, thermal annealing and high temperature implantation are observed to affect the ^{229}Ac root-mean-square displacement from the ideal Ca substitutional site, which suggests that additional lattice defects (e.g. neighboring F vacancies) may be involved. We will discuss to what extent these high-temperature processes can be exploited to optimize the Ca substitution, towards future studies of the isomer radiative decay and of its exploitation in the context of optical nuclear clock applications.

[1] P. Dessovic et al. , J. Phys.: Condens. Matter 26, 105402 (2014).

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Halo effects in the low-energy scattering of 15C with heavy targets

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Nuclear systems such as 6He, 11Li or 11Be are known to have an extended neutron distribution, the so-called neutron halo. The halo can be formed in nuclei close to the neutron drip line, where the separation energy of valence neutrons is small and the nuclear barrier becomes thin enough for the neutrons to tunnel out with larger probability. This effect enhances the diffuseness of the nuclear surface, leading to an extended density distribution. The halo structure has been observed in high-energy scattering measurements (⊠ 100 MeV/u) from the narrow momentum distribution of breakup fragments and the large value of the interaction cross sections. At low collision energies (˜ 5 MeV/u), the effect of the halo structure was for first time demonstrated by the strong absorption pattern found in the elastic cross sections, where the nuclear rainbow completely disappears. In the case of 6He and 11Li scattering this suppression can be attributed to the large neutron transfer and breakup probabilities.
In this work we present the first results on the low-energy scattering of the halo nucleus 15C with a 208Pb target at collision energies just around the Coulomb barrier. The isotope 15C is weakly bound for one-neutron removal by only 1218 keV, being the only known case of a pure 2s1/2 neutron-halo configuration. The experiment (IS619) was carried out at the XT03 beamline of the HIE-ISOLDE facility at CERN (Switzerland), using the GLORIA detector array and the SEC scattering chamber. Two high-purity 208Pb targets (>98%) of 1.5 mg/cm2 and 2.1 mg/cm2 were used for the measurements. The 15C beam was produced using a CaO2 primary target on a hot-cathode plasma source. Details of experiment and preliminary results on the angular distribution of the elastic cross sections will be presented and discussed in the framework of optical model calculations.

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Elastic scattering of p-halo 8B beam close to the Coulomb barrier

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